

Mobility Questionnaire

Utah Mobility

Please indicate if you have been to the following places in Utah (check all that apply):

- Logan
- Spanish Fork Hot Springs
- Dinosaur National Monument
- Alpine Sliding Rock
- Lake Powell
- Rio Tinto Stadium
- USANA amphitheatre
- State Capitol Building
- Memorial Grove Park
- Utah Lake
- Hurricane
- Jordanelle Reservoir
- Park City
- Antelope Island
- Great Salt Lake
- Salt Lake City Temple Square
- Red Butte Garden
- Big/Little Cottonwood Canyon
- St. George Ogden
- Bonneville Salt Flats
- Spiral Jetty
- Capitol Reef National Park
- Escalante National Monument
- Moab
- Zion National Park
- Bryce Canyon National Park
- Torrey
- Goblin Valley
- Provo
- Mt. Timpanogos
- Uintas
- City Creek Center
- Capitol Theatre
- Abravanel Hall
- Pioneer Park
- Liberty Park
- Sugarhouse Park
- Thanksgiving Point
- The Leonardo Museum
- Lagoon Amusement Park

US Mobility

Please indicate if you have been to the following regions of the United States (check all that apply)

- Mountain States other than Utah (Montana, Wyoming, Colorado, New Mexico)
- North Western (Idaho, Washington, Oregon)
- Western (Nevada, California, Arizona)
- South Western (Oklahoma, Texas, Arkansas)
- Central (Iowa, Missouri, Nebraska, Kansas)
- North Central (Minnesota, North Dakota, South Dakota)
- Southern (Louisiana, Tennessee, Alabama, Mississippi)
- Great Lakes (Wisconsin, Illinois, Michigan, Indiana, Ohio, Kentucky)
- South Atlantic (Florida, Georgia, North Carolina, South Carolina)
- Mid Atlantic (Virginia, West Virginia, Pennsylvania, New Jersey, Delaware, Maryland, Washington D.C.) North Atlantic (New York, Connecticut, Rhode Island, Massachusetts, Vermont, New Hampshire, Maine)
- Hawaii
- Alaska

Results

In the large-scale maze, the diameter was four times the size of the small producing more potential area for errors, therefore errors in the large scale maze were divided by four. A linear mixed-effects analysis in R (R Core Team, 2012) and lme4 (Bates, Maechler & Bolker, 2012) was used to assess the influence of Scale, Trial sequence (Trial Number), proximal and distal block order (Block Order), Sex, Cue Type (Cue), Mobility score (Mobility), and the interactions between Block Order and Sex, Scale, Sex, Cue and Mobility and the lower order interactions were used to predict maze performance (Scaled Error)¹. Additionally, 3D video game experience (Gaming) was entered as a covariate.

Our results showed a significant main effect of Trial Number, revealing that as the trials progressed that Scaled Error decreased. There were significant main effects of Sex

¹ Full equation in R: Scaled Error ~ Game + Trial + Block*Sex + Mobility*Sex*Cue + Sex*Cue*Scale + Mobility*Cue*Scale + Mobility*Sex*Scale + (1|Subject). Lmer automatically includes all lower order interactions and main effects.

and Cue and an interaction between Cue and Mobility, which are all qualified by the significant three-way interaction between Cue, Mobility, and Sex (See Figure 3).

To understand the interaction between Cue, Mobility, and Sex, we conducted a post hoc linear mixed-effects analysis to determine if Mobility and Cue interacted in the sexes differently. We used a similar equation as described above, but on males and females separately; therefore, interactions that included Sex were removed. Focusing on the relevant interaction, we found that Mobility and Cue interacted for the females, $b(-0.09)$, $t(636) = -0.09$, $p = .003$, but not for males, $b(0.01)$, $t(642) = 0.410$, $p = .681$, revealing the mobility improved female performance more for the proximal condition than the distal which is consistent with the findings reported in the manuscript.

To understand the interaction between Sex x Cue x Scale, we now focus on the Cue x Scale interaction from the previous two equations. For females there was not a significant interaction between Cue x Scale, $b(0.75)$, $t(642) = 1.21$, $p = .223$ but for males a significant interaction was revealed, $b(2.40)$, $t(642) = 4.07$, $p = .000$. This interaction suggests that scaled errors increased in the distal condition more of small environment than for the large environment. While not directly tested in the results reported in the manuscript, this finding broadly support the assertion that spatial abilities used in small-scale spaces may not generalize fully to spatial abilities used in larger scale spaces.

Table 1

*List of fixed effects with coefficients, standard errors and p-values from the statistical model. Coefficients for interactions including Cue indicate the change from distal to proximal cues. Coefficients for interactions including Sex indicate the change from female to male. Coefficients for interactions including Scale indicate the change from small to large mazes. Coefficients for interactions including Block Order indicate the change from proximal then distal to distal then proximal. * = < .05*

Fixed Effect	Estimate	Standard error	<i>t</i> -ratio	<i>p</i> -value
Sex	-4.40	2.03	-2.16	.030*
Cue	-4.65	1.09	-4.23	.000*
Scale	-2.02	1.69	-1.19	.233
Mobility	-0.06	.045	-1.54	.123
Trial Number	-0.40	.061	-6.55	.000*
Gaming	-0.83	.236	-3.54	.000*
Block Order	-0.09	.602	-0.16	.872
Scale	-2.02	1.69	-1.19	.233
Sex x Cue	-2.15	1.25	-1.71	.869
Sex x Scale	-0.81	2.45	-0.33	.739
Sex x Mobility	0.07	.064	1.18	.236
Sex x Block Order	1.29	.841	1.54	.123
Cue x Scale	1.63	1.23	1.32	.185
Cue x Mobility	-0.07	.035	-2.18	.029*
Scale x Mobility	0.08	.057	1.54	.122
Sex x Cue x Scale	1.73	.859	2.01	.043*
Sex x Cue x Mobility	0.10	.038	2.79	.005*
Sex x Scale x Mobility	-0.05	.079	-0.66	.508
Cue x Scale x Mobility	-0.03	.039	-0.82	.411